into the dorsal vessel in segment X. and, by way of the parietals, in segments XII. and XIII. This system is to be considered as representing the parietal vessels of the region in front of the last pair of hearts.

A Contribution to the Arterial System in Cryptobranchus: H. H. Keener.

Presented by J. B. Johnston. (Read by title only.)

The Larva of Naushonia crangonoides: Millett T. Thompson.

It was my good fortune, while at Woods Holl last summer, to identify and rear the larvæ of *Naushonia crangonoides* (Kingsley), a small Thalassinid Crustacean taken near Wood's Holl in 1893.

Three zoëa and two mysis stages are recognizable, during which stages the metamorphosis is inconsiderable, the 'habitus' being similar in all. The mysis phase, however, closes with a sharp change, the adolescent phase resembling the adult more closely than is usual among the Crustacea. The zoëa and mysis phases of this species are distinguished from all other known Crustacean larvæ—with two exceptions—by their peculiar form. The carapax is elongated behind the eyes into a 'neck'; the rostrum is short and arcuate; the body is without spines, though the anterior abdominal segments bear hook-shaped processes at their posterior angles; the sixth segment of the abdomen is very elongate. The mandibles are remarkably asymmetrical, although symmetrical in the adolescent stages and hence probably in the adult.

Two other larvæ resemble these in form; a larva of unknown parentage from the English coast, in regard to whose mandibles data are lacking; and the well-known larva of *Calliaxis adriatica* (Heller). The mandibles of the latter are like those of the *Naushonia* larva in shape, and similarly the one on the left is hook-shaped and the one on the right conical. Leaving out of the question the too little known English form, we find that the likeness between the larvæ of *Naushonia* and those of *Calliaxis* is not due to convergence, but to a close relationship existing between the species. This is easily demonstrable by comparing the adults of the two species.

Calliaxis and *Naushonia* do not seem to be very closely related to the other species grouped in the Thalassinidea, excepting possibly *Laomedia* (DeHaan). They perhaps represent a group which has approached the Thalassinidea in some respects, but whose descent must be sought along a different line from that of the other genera of this group.

On the Spinal Homologues of the Cranial Nerve Components: J. Playfair McMurrich.

The researches of Strong and C. J. Herrick have demonstrated the existence in the cranial nerves of five distinct components which may be termed the lateral line, somatic sensory, viscero-sensory, median motor and lateral motor components. The first of these are undoubtedly confined to the cranial region, but of the other four it seems probable that homologues exist in the spinal nerves. The somatic sensory components, being supplied to the skin, are naturally to be homologized with the components of the dorsal spinal roots which have a similar distribution, and the equivalents of the viscero-sensory fibers, distributed to the endodermal sense-organs and epithelium, are to be looked for in those sensory fibers from the posterior root ganglia which accompany the efferent fibers of the sympathetic system to the viscera.

As regards the two motor components, the homologues are not so apparent. The observations of van Wijhe have shown that the cranial muscles belong to two categories, the musculature of the branchial

arches being derived from the ventral mesoderm and the remaining cranial musculature from the dorsal mesoderm. It is noteworthy that the branchial musculature is supplied by lateral motor nerves and by these alone, while the dorsal musculature is supplied by median motor roots. Consequently the nerves supplied to the myotomic muscles of the trunk are to be regarded as the homologues of the cranial median motor nerves, while the white rami fibers, which control through sympathetic neurons the visceral musculature of the trunk derived from the ventral mesoderm, are the equivalents of the cranial lateral motor components.

The other ideas referred to in the paper may, for lack of space, be stated summarily. (1) The distinction between voluntary and involuntary muscles is a physiological and histological one, and not morphological, and the branchial musculature is morphologically equivalent to the visceral musculature of the trunk. (2) The branchiomeric segmentation is not identical with the myotomic, but in the cranial region there exist together two distinct segmentations. (3) Of these the branchiomeric segmentation is probably the older phylogenetically.

Geographical Distribution of Fresh Water Fishes of Mexico: S. E. MEEK. (Read by title only.)

Feeding Habits of a Spatangoid, Mœra atropos; a Brittle-Star Fish, Ophiophragma Wurdmannii, and a Holothurian, Thyone briareus: CASWELL GRAVE.

The observations here given were made on animals kept in the Beaufort U. S. F. C. Laboratory in aquaria in which a balance had been established between animal and plant life by means of diatoms. The spatangoids were reared from plutei.

The function of the so-called ambulacral brushes of spatangoids, which are so conspicuously waved about in the water above the animals when dug up and placed in aquaria, has been thought to be principally a respiratory one, but I have found that the animals use these brushes as hands for grasping bunches of sand and diatoms and carrying them to the mouth, the bristles of the brush being used as fingers.

Ophiophragma lives below the surface of the sand, with the oral surface of its disc and arms applied to some large object and with the tips of its arms extending into the water above. The foot-tentacles, distributed in pairs along each arm, are seen to be in constant waving motion, and by close observation it may be seen that they are busily engaged in passing little pellets of sand and diatoms toward and into the mouth. Down the oral surface of each arm is travelling a procession of pellets which have been gathered up by the more terminal tentacles and which are being successively handed on by the more proximal pairs.

Thyona, in feeding, fully extends the long branching tentacles which surround its mouth, and mops them about in the sand until they are well covered with sand grains and diatoms; then they are, one by one, turned back and poked down the throat; the mouth closes around the base of the tentacle and, when withdrawn, it is free from all débris.

A Method of Rearing Marine Larvæ: CASWELL GRAVE.

A method of rearing echinoderm larvæ which I have used for two seasons with much success consists in supplying the aquaria containing them with a generous amount of sand containing diatoms.

From twelve to twenty-four hours after fertilization, the eggs reach a stage in which they swarm at the surface of the water. At this time it is easy to get a pure culture of larvæ by skimming the